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Docket No.: ARL 03-01 (PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Eugene Napadensky

Application No.: 10/828,521 Confirmation No.: 4316

Filed: April 6, 2004 Art Unit: 1711

For: HIGHLY SULFONATED BLOCK COPOLYMER HYDROGELS AND USES THEREOF Examiner: Olga Asinovsky

DECLARATION OF EUGENE NAPADENSKY SUBMITTED UNDER 37 CFR 1.132

I, Eugene Napadensky, hereby declare as follows:

1. I received a Bachelor of Science degree in chemical engineering from Northeastern University in 1994. I have worked as a researcher in the area of block copolymer semipermeable membranes continuously since 1999. During this time I have been a coauthor on more than twenty publications and a coinventor on U.S. Patent 6,579,948 that is currently cited as prior art in the above-referenced application.

2. It is my understanding that claims 1-11 in the above-referenced application have been rejected as rendered obvious by the combination of U.S. Patent 6,579,948 of which I am a coinventor in combination with either U.S. Patent 5,039,752 (Storey et al.) or U.S. Patent 4,086,171 (Wood et al.).

3. After reading the outstanding Office Action (Paper No. 20060915) and reviewing these prior art references, it seems that the improved properties associated with the pending claims have not been fully appreciated in light of my previous work associated with Tan et al.

The purpose of this declaration is to clarify the actual teachings of Tan et al. as well as to show improved properties associated with the invention currently being claimed.

4. The teaching of my previous work on Tan et al. only extended to a degree of sulfonation up to 70 mole percent because at the time achieving sulfonation levels above 70 mole percent of the starting monomer in the copolymer was considered to stiffen the resultant copolymer beyond an acceptable level, as well as modifying the glass transition temperature (see Tan et al., column 5, lines 8-15; column 6, lines 37-44) noting the maintenance of glass transition temperature only up to 70 mole percent sulfonation. Additionally, prior to the work associated with the pending application, it was my thought as one of skill in the art that with increasing levels of sulfonation above 70 mole percent would result in levels of insolubility that would complicate synthesis and device component formulation.

5. Upon undertaking the research embodied in the pending application, it was discovered that increasing sulfonation over 70 mole percent created a level of selective permeability with regard to water and toxic compounds not attainable with the material developed and disclosed in Tan et al. See pending application paragraphs [0026]-[0028].

6. To further illustrate the benefits of the claimed copolymers over those disclosed in Tan et al., the following properties of sulfonated polystyrene-polyisobutylene-polystyrene copolymers were measured with sample names S-SIBS-0 through S-SIBS-58 corresponding to samples made according to Tan et al., while those having a suffix numeral of 77, 85, 88 or 85-Cs (corresponding to 85% sulfonation and cesium cation instead of proton) correspond to those disclosed in the pending application paragraphs [0028] and [0029]. The prototypical membrane Nafion 117 also measured as a control. This data is provided below.

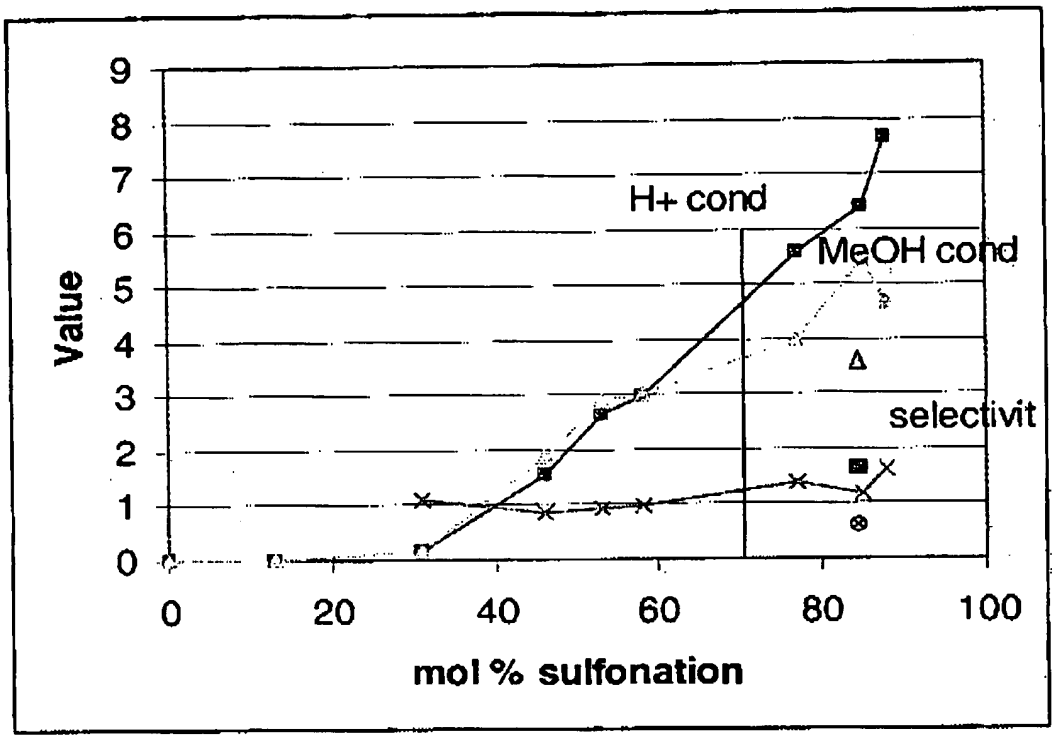
Sample Name	Sulfonation Level (mole %)	IEC (meq/g)	σ‡ Proton Conductivity (S/cm) (x 10^2)	P§ Methanol Permeability (cm^2/s) (x 10^6)	σ/P Selectivity (S s/cm^3) (x 10^{-4})
Nafion 117	-	0.91	2.7	2.01	1.34
S-SIBS-0	-	-	-	-	
S-SIBS-13	13	0.36	0.000225	-	
S-SIBS-31	31	0.81	0.177	0.16	1.11
S-SIBS-46	46	1.13	1.56	1.86	0.84
S-SIBS-53	53	1.28	2.66	2.90	0.92
S-SIBS-58	58	1.41	2.98	3.01	0.99
S-SIBS-77	77	1.78	5.58	4.01	1.39
S-SIBS-85	85	1.97	6.38	5.41	1.18
S-SIBS-88	88	2.04	7.64	4.69	1.63
S-SIBS-85-Cs	85	1.97	1.86	3.83	0.49

‡ Measured *normal to the plane* of the film using AC impedance spectroscopy. Details of this technique are described in more detail elsewhere.[1]

§ Measured with a diffusion cell equipped with an infrared spectroscopic detector. The details of this procedure are described in more detail elsewhere.[2]

7. To facilitate interpretation of this data, proton conductivity (square data point), methanol conductivity (triangle data point), and water/methanol selectivity (cross) data are plotted in arbitrary value units as a function of percent mole sulfonation with the larger data symbols at 85 mole percent sulfonation corresponding to cesiated copolymers. A vertical line is provided corresponding to 70 mole percent to delineate the prior art from that of the currently pending application.

[1] Elabd, Y.A.; Walker, C.W.; Beyer, F.L. *Journal of Membrane Science* (submitted for publication, 2003).
[2] Elabd, Y.A.; Napadensky, E.; Sloan, J.M.; Crawford, D.M.; Walker, C.W. *Journal of Membrane Science*, 217 (2003) 227.



8. I believe the data shown in this graph indicates trends in proton conductivity, methanol conductivity and selectivity for the claimed subject matter that was not apparent to me as one of skill in the art based on my earlier work on Tan et al. These copolymer properties above 70 mole percent sulfonation make the inventive copolymers much more attractive candidates for fuel cell and apparel applications than those of Tan et al. These results are not suggested to me in the teachings of Tan et al. and remain to be fully explained. By way of example, the decrease in methanol conductivity with the simultaneous increase in proton conductivity observed at 88 mole percent sulfonation still remain subject to mechanistic investigation.

9. Based on the above considerations, I do not believe that U.S. Patent 6,579,948 is appropriately construed as rendering obvious pending claims 1-11 in the above-referenced application.

10. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true. These statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Eugene Napadensky
Eugene Napadensky

Date: Jan 25/2007